Remarks:

Reconsideration of the application is requested.

Claims 1-35 are now in the application. Claims 1, 10-12, 14, 17-24, and 28-33 have been amended. Claims 34-35 have been added.

In item 3 of the Office action, the Examiner objected to the disclosure because an EPO document was incorporated by reference. However, MPEP § 608.01(p) states, "Nonessential subject matter may be incorporated by reference to (1) patents or applications published by … regional patent offices." For this reason, the reference to the European patent application should be allowed.

In item 4 of the Office action, the Examiner objected to claims 17-24 and 28-30 for using the transitional phrase, "further comprising" to narrow the scope of an existing limitation. Claims 17-21 have been rewritten to write the subject matter as an addition step that would correctly use the transition phrase "further comprising". Claims 22-24 and 28-29 have been amended to use the transition phrase "wherein" to further define existing steps. Claim 30 has not been changed because it includes additional steps that are properly introduced by the phrase "further comprising".

The Examiner also objected to the wording of claims 1-13 and 31-33 as not representing the essence of the invention. The Examiner suggested alternate language. Claims 1 and 31-33 have been amended to include the Examiner's recommendation.

In item 7 of the above-identified Office action, the Examiner has rejected claims 1-33 as being indefinite under 35 U.S.C. § 112, second paragraph. More specifically, the Examiner has stated that the terms "low-viscosity" and "storage-stable" were not defined by the claim or the specification. The independent claims, claims 1, 14, and 31-33 have been amended to delete these phrases.

In item 8 of the Office action, the Examiner rejected claim 10 for containing the phrase "a primary product". The phrase has been amended to --said primary product--. This feature was introduced in amended claim 1. Accordingly, claim 10 is definite.

In item 9 of the Office action, the Examiner rejected claim 11 for containing the indefinite phrases "*good* electrical conductivity" and "*good* thermal conductivity". Claim 11 has been amended and the phrases deleted. Amended claim 11 states that the graphite is "thermally conductive". In addition, the conductivity, which is an inverse of the resistivity, has been

specified in the claim. Support for the change can be found on page 28 of the specification.

In item 10 of the Office action, the Examiner rejected claim 12 being indefinite under 35 U.S.C. § 112, second paragraph, for omitting essential structural cooperative relationships of elements. Claim 12 has been amended to clarify that the body is formed by non-overlapping and exhausting parts: a surface, regions close to said surface, and a "remaining part" that is to be understood as all remaining parts. Accordingly, claim 12 as amended is definite.

Accordingly, the specification and the claims meet the requirements of 35 U.S.C. § 112, first and second paragraphs. Should the Examiner find any further objectionable items, counsel would appreciate a telephone call during which the matter may be resolved. The changes are neither provided for overcoming the prior art nor do they narrow the scope of the claim for any reason related to the statutory requirements for a patent.

In item 12 of the Office action, the Examiner rejected claims 1-6, 11-16, 19-24, and 31-33 as being fully anticipated by Woods (U.S. 6,656,580) and Technical Data Sheets for Resinol 90C and Resinol RTC under 35 U.S.C. § 102(e). The rejection has been noted and the claims have been amended in an effort

to define more clearly the invention of the instant application.

Before discussing the prior art in detail, a brief review of the invention as claimed is provided. Claim 1 calls for, *inter alia,* a synthetic resin-impregnated body, comprising:

> a primary product formed of an expanded or at least partially recompressed expanded graphite having a liquid-accessible open pore system;
>
> said primary product being impregnated with at least one of:
>
> > at least one solvent-free polymerizable acrylic resin system; and
> >
> > polymers obtained by curing said at least one resin system.

<u>Claims 1-6:</u>

Woods, col. 3, ll 64-65, teaches, "*A low density graphite sheet* having *a graphite density of about 0.08 to about 0.8 g/cm*^{3} is provided for sealant infusion." (Emphasis added by Applicant.) In contrast to this requirement given in the specification, which seems indispensable, claim 1 of Woods merely recites, "[A] graphite sheet having opposed planar surfaces defining an interior portion therebetween, said sheet being formed from exfoliated graphite particles to provide said interior with pores and defining a graphite density of said sheet." Only claim 2 narrows the density to the range

given in the specification. Regardless of whether the phrase "defining a graphite density of said sheet" has to be read in light of the specification, in Woods, the density of the primary product must be low enough to allow for further compression of the impregnated product. *See* claim 1, step d.

Indeed, Woods failed to reach the claimed impregnation degree of > 70 % of the open pore volume (*see* Woods' claim 17), when a primary product with a higher density was used. According to col. 6, ll 19-22, and example 2, in a primary product having a density of 1.14 g/cm^3, only 48% of the voids were filled.

<u>Claim 11:</u>

Woods does not quantify the electrical conductivity.

In contrast, amended claim 11 describes a network having "an electrical volume resistance from 0.10 to 0.77 mΩ." Resistance is the inverse of conductance. Page 23 of the specification specifies of volume resistance.

<u>Claim 13:</u>

Claim 13 describes, *inter alia*, "The synthetic resin-impregnated body … wherein a continuous resin surface film is not present."

The Examiner argues that Woods, col. 6, ll 50-59, teach the absence of a continuous resin surface. However, Woods col. 6 generally describes a curable "sealant" that necessarily connotates a continuous surface. The cited section (ll 50-59) merely a describe that a pattern can be impressed in the sealant layer not through the sealant layer. Accordingly, Woods does not teach features of claim 13.

Claims 31-33:

Claims 31-33 describe a sealing element, a fuel cell component, and a heat-conducting element, respectively, that utilize the synthetic resin-impregnated body.

Claim 35:

Amended claim 32 of the instant application describes a "fuel cell component for use in a fuel cell utilizing oxygen as an oxidant."

Within the passage cited by the examiner, Woods arguably discloses only the application as a fuel plate (that is the anode plate 222A of the fuel cell depicted in fig. 4, see col. 7, l. 63 - col. 9, l. 3) in a fuel cell. However, according to the data sheet for Resinol® products are not recommended for use in pure oxygen and/or oxygen rich systems; *see* p. 1 right column of the data sheets, paragraph "General Information". But in fuel cells (such as those described in

claim 32), oxygen containing air or even substantially pure oxygen is used as the oxidant at the cathode (col. 7, ll 44-45). Thus, at least for fuel cells operated with oxygen as the oxidant, the information on the data sheet would teach away from introducing such resin in the cathode (oxygen) plate of a fuel cell.

Claim 34:

Claim 34 defines the permeability as being between "0.001 to 0.016 $mg/m^2 \cdot s$." Support for these values can be found in the original specification in the chart on page 23.

In contrast to claim 34, Woods never quantifies the gas permeability.

Accordingly, claim 34 is novel over the prior art.

Claims 14-16 and 19-24:

The process claimed in the instant application differs from the process disclosed by Woods.

Claim 14 of the instant application teaches, *inter alia*, the following steps:

> providing a primary product formed of expanded or at least partially recompressed expanded graphite having a liquid-accessible pore system;

impregnating the primary product with at least one solvent-free polymerizable acrylic resin system to form a resin-containing, uncured intermediate product; and

finally subjecting the resin-containing, uncured intermediate product to a curing treatment for the at least one resin system.

In contrast, the process of Woods comprises the following steps: (cf. claim 1 of the patent):

a. providing a graphite sheet (with the limitations regarding the density discussed above in relation to claim 1 of the present invention);

b. providing a curable sealant;

c. contacting the sealant with at least one of the surfaces of the sheet allowing said sealant to communicate through said pores (i.e. impregnation);

d. *compressing* said sheet to form a graphite plate having graphite density after compression, wherein said graphite density is greater after compression than before compression (optionally combined with pattern forming, see claims 5 and 6);

e. curing said sealant contained within said pores to seal said plate. (Emphasis added by Applicants.)

It is clear from Woods' claim 1 that *compression* is an indispensable, obligatory step of his process sequence. It has to be done in any case, independent from the optional pattern forming.

The reason for this extra compression step is the low density of the graphite sheet used as the primary product of 0.08 ...

0.8 g/cm^3 (col. 3 ll 64-65) or even 0.08 ... 0.5 g/cm^3 (col. 5 l. 1), more specifically 0.22 g/cm^3 in Example 1. The sealant-impregnated sheet is mechanically compressed to form a graphite plate which, after the resin is cured by a free radical mechanism, is substantially gas impermeable (col. 4 ll 3-6). The mechanical deformation typically results in a more dense sheet. For example, a graphite sheet with a graphite density of about 0.08 to about 0.5 g/cm^3 may be mechanically deformed resulting in a compressed sheet or plate with a graphite density greater than 1.0 g/cm^3 (col. 6 ll 36-40) or 1.1 g/cm^3 (col. 8, ll 47-78).

Such higher densities are needed to make the graphite plate less permeable and more strong (col. 7, ll 11-12). But the higher the graphite density, the more difficult is the infusion of the sealant (col. 5, ll 62-63) and the lower is the extent of void filling (col. 6, ll 17-23). According to col.3, ll 26-32, the aim of Woods's invention is to provide a graphite sheet that has both high density and high amount of infused sealant, and to obtain this high degree of sealant impregnation without the requirement of multiple, complex processing step. To achieve this, the graphite sheet is impregnated before it is compressed (col. 6, ll 45-46).

In the invention of the instant application, there is no such narrow limitation in the density of the primary product. Of

course, primary products with higher densities will take up less sealant. In the examples of the present invention, the highest resin content (weight fraction of resin in the product) obtained with a starting material with a density of 1.0 g/cm³ is 36.1 %, and this is obtained only after 5 hours of impregnation. Woods reaches a resin weight fraction of about 80% with primary a product having a density of 0.22 g/cm³ (calculated from the weight before and after impregnation in example 1). Despite the resin content being much lower in the present invention, a low permeability was obtained.

In contrast, Woods claims only graphite plates with at least 70% of the pore volume filled by the sealant. Plates with lower filling degrees are beyond the scope of his invention, obviously they are considered less useful for the application as highly impermeable fuel cell plate or gasket. The plate of example 2 with a starting density of 1.14 g/cm³, void fill of only 48%, and a weight based resin content of only 19.8 % (which accurately falls in the range of the present invention) is merely given as a negative example to emphasize and distinguish the high void fill obtained by Woods' invention (*see also* col. 6, ll 19-22).

Thus, Woods's disclosure teaches away from the present invention that impregnated bodies obtained from primary

products with a density up to 1.0 g/cm^3 and above, having a weight-based resin content of at most 50%, have low gas permeability and are suitable or the application as a gasket or fuel cell fluid flow plate.

Claims 15 and 16 of the instant application teach optional shaping (pattern forming) process steps. Furthermore, as explained above, the shaping process in the present invention is performed with a different body than in Woods's invention (*see* the comments regarding claim 14 above). Therefore, the broad density ranges of the primary product given in claims 19-21 of the present application are not anticipated by Woods (*see also* the comments regarding claim 14 of the present invention).

The Examiner argued that the density ranges of the primary product given in claim 19 (0.1 to 1.8 g/cm^3), claim 20 (0.3 to 1.5 g/cm^3), and claim 21 (0.5 to 1.3 g/cm^3) of the present application are anticipated in Woods' specification col. 4 l. 57-61. While Woods mentions that graphite sheets can be made or are available in a wide range *of* densities, most of Woods's specification emphasizes that the graphite sheet used as the primary products must be of low density (col. 4, l. 1; col. 5, l. 14), and this low density was specified as being in the range of 0.08 to 0.8 g/cm^3 (col. 3, l. 64-65; col. 4, l. 66) or even 0.08 to 0.5 g/cm^3 (col. 5 l. 1 and l. 38) while a

primary product with a density *of* 1.14 g/cm^3 was considered not sufficient (col. 6, l. 19-22, example 2).

Furthermore, Woods states that it is exceedingly difficult to fill more than about 70% by volume of the voids in compressed high-density grades of graphite sheets that are typically used for fuel cell construction (col. 6, ll 42-45). But the foils typically used for fuel cell construction in the prior art were of course those of the upper range of the given density spectrum of 0.08 to 1.4 g/cm^3 because of the requirements of low permeability and high mechanical strength. Thus, by the statement that, "[I]t is exceedingly difficult to fill more than about 70% by volume of the voids in compressed high-density grades of graphite sheets that are typically used for fuel cell construction," Woods indeed concedes that his invention is not suitable for the whole range of graphite sheet densities available.

In item 14 of the Office action, the Examiner rejected claim 7-9 and 25-29 se being unpatentable over Woods and the Technical Data Sheets for Resinol 90C and Resinol RTC, under 35 U.S.C. § 103(a).

One with ordinary skill in the art would not have sufficient motivation to change the prior art to make the invention as claimed obvious.

As previously discussed, Woods strongly emphasizes the need of infusing large amounts of sealant (col. 3, l. 30), high void filling (i.e. up to 95%, *see* col. 4, l. 2; more than 70%, *see* col. 6 ll 42-43; and claim 17) and, therefore, large weight based resin contents. This would probably discourage one with ordinary skill in the art to utilize lower resin uptake.

In contrast to the prior art, the invention of the instant application utilizes the unexpected result that even a lower resin content, as it is invariantly obtained with a more denser primary product, results in suitable product parameters e.g. a low leakage rate.

Accordingly, claims 7-9 and 25-29 would not be obvious in light of the prior art.

In item 15 of the Office action, the Examiner objected to claims 10, 17-18, and 30 for depending on a rejected base claim but indicated that they contained allowable subject matter. Accordingly claims 10, 17-18, and 30 have been rewritten as independent claims and should be allowed.

Accordingly, none of the references, whether taken alone or in any combination, either show or suggest the features of claim 1. Therefore, claim 1 is patentable over the art. And,

because all of the dependent claims are ultimately dependent on claim 1, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1-35 are solicited. In the event the Examiner should still find any of the claims to be unpatentable, please telephone counsel so that patentable language can be substituted.

Attached find a payment of $552 to provide for two additional extra total claims and 6 extra independent claims.

Petition for extension is herewith made. The extension fee for response within a period of one month pursuant to Section 1.136(a) in the amount of $110 in accordance with Section 1.17 is enclosed herewith.

If an extension of time for this paper is required, petition for extension is herewith made.

Please charge any other fees that might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

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